Design for Internet of Things
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Course Conclusion

Folks, as we come to the last part of this module, I want to try and tell you what is likely to happen about IoT okay, what is the future. Particularly if you look at the course that we went through, we did lot of embedded stuff. We looked at controllers, we tried to look at how to build IoT nodes and all that, right. And we looked at ADCs, we looked at how to choose controllers, we looked at wireless systems.

And we looked at RFID. We began a lot, discussed a lot about RFID. What is going to happen folks in the next five years? The five years, next five years, is already here today folks, it is already here today. And I want to direct your attention to a very interesting article, still in the lab stage, but maybe in six months, maybe in one year, it is going to come out, and then capture each of our imagination.

Think about a water bottle, you have a nice wrapper to indicate what type of water bottle. Kinley for instance, there is a label which is Kinley or Bisleri or any one of them. Think about a controller on that as thin as that as thin as paper. But a full-fledged controller out there. How to power it? Yeah, there can be any way, you can do energy harvesting. Maybe there is an RF source.

The system is so ultra-low power that with just some simple RF, ambient RF, or maybe some simple temperature differentials, you will be able to power it. And once you power it, you can track it. You can sense it, you can sense how much is the content that is out there. So you can put a sensor, you can track it, you can localize it, you can do all kinds of things once you think about.

Even you know things like water bottles for instance, right? That is the level at which IoT will start networking components. IoT will start networking objects, every object will become smart. Am I joking? Or am I serious? I am very serious, because I am not saying this. I am going to show you an article, which essentially takes you to that

direction. The article is called plastic arm. And it is right here. Look at what they have done.

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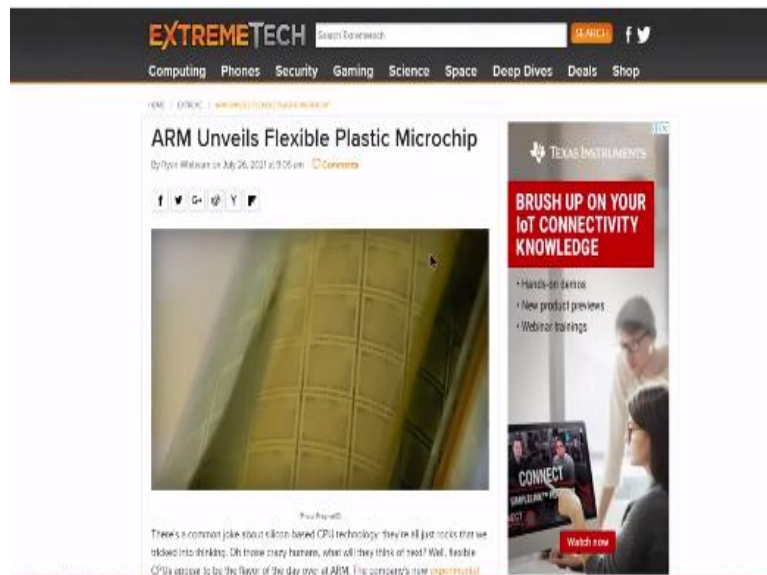
ARM unveils flexible plastic microchip. Look at the picture that he has put here. And what is this all about?

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It is an experimental system on chip that uses plastic instead of silicon, and is now really a reality. It is not very powerful, but it can be integrated into anything, almost anything without fear of snapping it in any halfway. What it actually uses is it does not use existing semiconductor designs, but it uses MO, metal oxide thin film transistor technology. It uses thin film transistor technology on a flexible substrate.

And what is this plastic? It is ARM processor folks. It is ARM processor, and it is called plastic arm on a new plastic chip essentially. Some of the components on this new plastic chip are you have RAM of 128 bytes, okay? There is a Cortex-M CPU core, okay. All of that is integrated into this.

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You see he has put the di-micrograph of the system here. The MOs core CPU is low power part. It is not new to the plastic chip. The innovation is the flexible substrate folks. That is where the innovation is, okay. The entire chip is only 60 square mm and 56,340 components and 18,000 logic gates, okay. It is the most flexible CPU in the world. And yeah, it needs about 21 milliwatts as of today, okay.

And yeah, and it is efficient enough for IoT and wearable applications, where it is not feasible to charge devices frequently or keep them connected to power. Also, you can fold it half while all this is going on.

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So you can read this article and look at how the whole mystery of IoT is unfolding on us, when it comes to a new type of material over which controllers can be actually built, okay. What they are claiming is it is still a prototype, but I am sure by the time you follow this link closely, you will see that it is already out there.

Well, there are issues, it is not that it is going to be a magic on a silver bullet for everything, because the issue that is actually preventing flexible SoCs from flooding in the market is because of the power efficiency, okay. MO core, the M0 core is a low power design ideal for IoT technology. 99% of that 21 milliwatts is actually wasted, okay. See, the overall chip is also larger than the silicon cousins.

That does not matter too much if it is going to be flexible on flexible sheet of plastic, but the power drawbacks are a real hurdle. And therefore, you can expect plastic ARM devices to continue on their evaluation. It would not be fast, it would not be energy efficient, but it is going to put it on a lettuce to track shelf life. And that is the idea.

You can go and put it on a and some greens that you buy from the supermarket and you actually know the shelf life of that, it is going to be cheap. And it is going to work, okay. I think that is the future. Power is going to hold the key. Low power is important. But all these thin film technologies are going to come invade us and almost anything around you will be IoT enabled, and therefore enjoy looking around in the next, let us say half a decade or so, on this aspect. Thank you very much.